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(54) Title: METHOD FOR PRODUCING A DOUGH-BASED PRODUCT

(57) Abstract: The invention relates to a method for making a bread-type dough comprising: preparing a wheat dough part comprising wheat flour, fat and water and mixing in a manner effective to form an homogeneous and cohesive gluten structure and sheeting; preparing a non-wheat dough part comprising non-wheat flour and water and mixing to form an homogeneous hydrated mass of dough cohesive enough to be subsequently handled; assembling the wheat dough with up to 80 % by weight of non-wheat dough and laminating until to form a composite resulting dough structure.

WO 02/32229 A1

METHOD FOR PRODUCING A DOUGH-BASED PRODUCT

The invention relates to a method for producing a novel texture of dough-based product, in particular, which can be processed in a sheeting line as a usual dough. The invention relates more particularly to a dough-based product including specific textural characteristics and the taste of non-wheat flour. The dough-based product of the invention is more particularly, although non exclusively, related to frozen or chilled dough or bread-type products.

A bread-type product is made by baking a dough which has for its main ingredients wheat flour, water, yeast, salt and other possible ingredients. When these ingredients are mixed in correct proportions, three processes commence: (i) the protein in the flour begins to hydrate to form gluten, (ii) air bubbles are folded into the dough trapped in the gluten network and (iii) enzymes in the yeast start to ferment to produce carbon dioxide which diffuses into the air bubbles and brings about expansion of the dough. The role of gluten in the bread-making process is important. The gluten forms the continuous three-dimensional structure of the dough. It has peculiar extensible elastic properties: it can be stretched like elastic and possesses a degree of resilience.

The use of non-wheat flours or starches in bread-type dough is known. Raw materials such as rye, oat and barley flours are traditionally associated with bread or dough-making. Non-traditionally, raw materials such as maize, rice or tapioca flour have been used as possible wheat replacers in the composition of dough for making bread. This approach, motivated either by economic or nutritional considerations, has mostly overlooked the potential for "exotic" raw material as agents of texture in the creation or modification of bread.

Most of the previous studies in bakery have been focused on bread and on mimicking as far as possible the texture and appearance of "normal" wheat bread. Since no other flour has the bread-making ability of wheat flour, any

substitution results in a loss of the desirable sensory and textural properties associated with wheat bread. A usual conclusion in most of the existing literature is that starch can be replaced only by rye or barley starch in bread (Hoseney, R. Carl. 1992. Physical Chemistry of Bread Dough. In *Physical Chemistry of Foods*, Schwartzberg H. G. and Wartel. W.H (eds.), pp. 445, Marcel Dekker, New York).

In usual replacement of the wheat flour, the non-wheat flour or starch is dry-mixed with wheat flour and the dough-making process is carried out including mixing with water, salt and other ingredients, optionally fermenting, sheeting and optionally final proofing the dough before baking it. The resulting dough is frequently weaker and its ability to be handled in a sheeting/make-up line diminishes by comparison to the well-controlled textural properties of wheat dough. Usually, the dough becomes non-machinable in conventional rolling lines when the amount of non-wheat flour exceeds 15 wt. % of the total flour content. As a result, the beneficial textural, nutritional and taste features of non-wheat flour have been largely overlooked in industrial bakery field or at least only exploited to a minor extent in the dough; i.e., only as replacer in relatively small proportions (less than 15 wt. %), which has proved to be ineffective to emphasise the specific benefits of the "exotic" flours.

It is also known to make non-wheat bread by replacing the gluten structure of wheat by gluten substitutes having binding functions and film forming properties to retain gas bubbles such as xanthan gum, carboxy methyl cellulose (CMC), hydroxy propyl methyl cellulose (HPMC), hydrocolloids or surfactants (Kent's Technology Of Cereals, Fourth Edition, N.L. Kent and A.D. Evers, Pergamon, p. 215). However, these added components have a tendency to provide a chewy and non-crispy texture.

WO 00/59309 relates to a multi-layer toaster product comprising a first layer and a second layer wherein the first and second layers are constructed of dissimilar materials. The product is a toaster product having enhanced

organoleptic properties which is more likely a freshly based cookie, and/or dessert and which is suitable for use in a vertical toaster. The first and second layers are simply assembled by binding but it does not result in a composite bread-type product.

- 5 WO 97/25871 relates to a laminated and/or flaky and/or extruded dough product comprising a main strip of a first dough and additional dough pieces made of at least one second dough into the main strip. The invention is primarily to superficially add a second dough of higher viscosity on a main band of dough but the dimensions and thickness of the dough band remains
10 unchanged. The first and second doughs are both based on wheat flour.

The object of the present invention is to offer the possibility of creating a wide range of novel textures and tastes to make a crispy bread-type dough that retain the unique characteristics of non-wheat flour while still keeping the ability of the dough to be handled during sheeting and laminating steps usually
15 carried out in the dough-making process.

Another object is to offer the possibility to benefit more largely from the nutritional, textural and other specific features of non-traditional non-wheat ingredients but in a well-structured dough product.

Another object of the invention is to propose a dough product that can
20 develop a satisfactory structure by proofing and baking as a normal bread and which can optionally be frozen without loss of its textural characteristics.

The objects are attained by a method for industrial making a bread-type dough comprising:

preparing a wheat dough part comprising wheat flour, fat and water
25 and mixing in a manner effective to form an homogeneous and cohesive gluten structure and sheeting;

preparing separately a non-wheat dough part comprising non-wheat flour and water and mixing to form a homogeneous hydrated mass cohesive enough to be subsequently handled;

5 assembling the wheat and non-wheat dough and laminating until to form a composite dough structure.

Therefore, the primary feature according to the method of the invention is to incorporate non-wheat flour as a dough rather than as a flour into already prepared wheat dough in the dough-based making process as opposed to the prior art which considers non-wheat dough merely as a replacer of wheat flour
10 in the preparation of the dough. It has been surprisingly found that the resulting dough structure is easy to handle in the sheeting line and leads to a well-developed dough product. By using this method, novel textures can be created that can not be obtained using non-wheat flour alone as a replacer of wheat flour in the usual dough preparation.

15 As another advantage, excessive handling can also be avoided successfully by minimum laminating of the wheat dough and non-wheat dough together while forming one integrated composite dough with unique textural properties.

In a preferred aspect of the invention, the wheat dough is used as a carrier
20 of the non-wheat dough and the non-wheat dough is used as the dominant component of the final dough product to thereby influence the texture and taste to the resulting dough product. For that, the proportion of wheat dough : non-wheat dough ranges respectively, of from 20:80% to 40:60% by weight, preferably of from 30:70 to 35:65% by weight of the total dough product. It
25 has so been surprisingly found that according to the method of the invention, up to 80% non-wheat dough could be combined while keeping a final dough with sufficiently well developed characteristics capable of being processed in usual dough-making production lines. By using such a large amount of non-wheat dough, i.e., consequently leading to use large amount of non-wheat flour,

it is so possible to create novel textures that cannot be obtained using wheat flour alone or small amounts of wheat dough replacers.

The structure of the non-wheat dough is created by partially gelatinised starch before assembling so its level of structure is not as high as for a gluten
5 network. However, the gluten structure of the wheat dough has proved to be sufficient to serve as a proper support for the relatively unstructured non-wheat dough.

The term "dough" in the present invention refers to the cohesive product that results from the mixture, eventually after subsequent proofing, of flour or
10 starch, water along with possibly fats and other usual ingredients normally entering in the composition of usual dough such as salt, yeast or chemical leavenings, fibres, egg proteins, milk proteins and sugar. The addition of fibres in smaller amounts may be suitable to improve the handling properties of the non-wheat dough. The fibres may be potato fibres or other suitable fibres.

15 In the present invention, "sheeting" refers to the action of rolling or extending a discrete piece of dough to form a sheet of dough. "Laminating" refers to the action of forming a laminate by superimposing several sheets or layers of dough. "Mixing" refers to the actions of doing a blend and kneading the ingredients of the dough.

20 An essential structural ingredient forming component for most non-wheat raw material is starch. It has been found important to have the starch partially gelatinised in order to obtain a dough-like consistency for the non-wheat dough. Partial gelatinisation of the non-wheat starch may be obtained by mixing the non-wheat flour with a hot aqueous liquid such as water or water
25 and oil. Starch gelatinisation of non-wheat flour normally requires heat and water to occur. Therefore, starch gelatinisation may be obtained either during the mixing step by adding hot water or before mixing by soaking the flour in hot or boiling water or steaming. The degree of gelatinisation greatly depends on the type of flour and the process conditions. As resulting from a proper

degree of gelatinisation of the starch, the non-wheat phase becomes "workable" under the form of a dough that is capable of being flattened into a substantially cohesive block or layer of non-wheat dough. The dough should preferably be capable of being flattened to form a block of thickness of from 5 to 30 mm.

5 The choice of the non-wheat flour for the non-wheat dough part depends upon its capability to form a relatively cohesive dough when mixed to an aqueous medium alone or with the other functional ingredients to produce the non-wheat dough part. Other functional ingredients may be fat or oil, fibres, egg, milk proteins or combinations thereof.

10 Suitable non-wheat flours of the invention are selected among the group consisting of maize, tapioca, rice, fruit, pulse or tuber flours or combinations thereof. Plantain flour (*Musa paradisiaca*) and chickpea flour (*Cicerarietinum*) are suitable examples of fruit and pulse flour. In the specific context of the invention, the traditionally used cereals in bread-making: barley, rye and oat
15 are excluded from the group of non-wheat flour. However, those cereals may be used in partial or total replacement of the wheat flour when preparing the wheat dough part. As "cohesive" dough, it is referred to the capability of the non-wheat dough to be handled as a continuous mass when laminating it onto the wheat dough. However, most non-wheat dough cannot normally be sheeted
20 and further laminated by themselves.

 The non-wheat flour as selected preferably contains a wide range of starch granule sizes of from 2 to 50 microns. The starch granules may vary from small sizes of 2-10 microns for rice to large sizes of 10-50 microns for plantain. However, the method of the invention is not specifically limited to
25 flours of any specific granule size.

 The non-wheat dough is made essentially from non-wheat flour although a minor amount of wheat flour may be envisaged as for increasing its workability (elasticity and extensibility). In general, it has been shown that the non-wheat dough part should comprises of from 35 to 55% by weight of non-

wheat flour, 0 to 25% fat, 20 to 50% water, 0 to 2% salt, optionally egg, fibres and sugar.

The wheat dough may be chosen among various types of dough.
Preferably, the wheat dough comprises from 45 to 60% by weight of wheat
5 flour, 1 to 15% fat, 20 to 40% water, 0.1 to 2% salt, optionally egg and sugar.

It is preferred to use wheat flour having good breadmaking quality.
Preferably, the wheat flour should have a relatively high protein content
capable of forming a strong gluten structure during its preparation. Although
the quality of dough is not only based on the protein content, the protein
10 content of the flour should preferably be of from 5 to 14%, more preferably of
from 10 to 14% by weight. The gluten-protein complex is a mixture of a large
number of proteins containing about an equal mixture of two basic groups: the
prolamins, called gliadin, and the glutelins, called glutenin. The mixture of the
gliadins and glutenins give gluten its viscoelastic properties. Additives may be
15 added to the dough composition in order to reinforce the tenacity of the gluten
network that are known in the art such as ascorbic acid, lecithin, vitamins or
others.

Preferred fat used in the dough recipes is selected from the group
consisting of solid shortenings or oil. Preferred shortening compositions
20 include margarine, butter fat or lard. Oils may include vegetable or animal oils.
Vegetable oils are preferred such as rapeseed, corn, peanut, palm, palm-kernel,
sesame, soybean, sunflower or olive oil.

In the present invention, the wheat flour primarily refers to soft wheat or
Triticum aestivum although a certain amount of hard wheat, or *Triticum durum*
25 may also be used.

Non limitative models of the portion of wheat dough suitable for the
invention are, in particular: pizza dough, piroq dough or pastry dough.

Pizza dough is lean elastic wheat-based low-fat dough that functions well as a carrier for the non-wheat dough. During lamination with the non-wheat dough, the resulting overall dough structure shows no sign of breaking, even at low levels of wheat dough (30-35%).

5 Bulk fermentation of the pizza dough is necessary to achieve a well developed cellular structure of the final ferment in batch before assembling to the portion of non-wheat dough. A second proofing is also needed after combining and laminating the wheat dough with the non-wheat dough to relax the resulting dough before baking. A second proofing has shown a better
10 integration of the two types of dough together due probably to the production of carbon dioxide that swells the resulting dough to a certain extent due to the elastic and resistant structure of gluten that has been formed during mixing.

Piroq dough is a short dough, somewhat drier and less elastic than pizza dough, but it has proved to be a suitable carrier with good results as a level of
15 at least 30% by weight. Piroq dough is a yeast containing dough that also requires proofing before assembling to the non-wheat dough part and a second proofing after sheeting and laminating with non-wheat dough.

Pastry dough is a fat-containing dough that functions well as a carrier with good elasticity and extensibility. During lamination, the final pastry/non-
20 wheat dough shows no sign of breaking even at low levels (30-35% of pastry dough). Fat has a tendency to make a softer and shorter texture. However, the elastic properties are kept sufficiently good when the fat content of the dough is relatively low, preferably under 30% by weight of fat.

In the preparation and mixing stages, the wheat and non-wheat dough are
25 processed independently. The dough parts may be separately mixed in a standard spiral mixer such as a Kemper mixer. The wheat dough part provides primarily the structure and strength to the final dough product. The wheat dough is prepared in a usual manner known in the art including dry mixing of the dry ingredients, in particular flour, salt and, if needed, shortening, yeast and

sugar. Then, the liquid ingredients are added to the dry mixture such as water and oil and mixing is carried out within a limited time to develop a proper gluten structure in the wheat dough. Mixing is important both for wheat and non-wheat dough as it provides hydration of the flour and air incorporation into the dough. Hydration of the flour promotes the formation of fibrils whereas incorporation of air forms the nuclei that determine the number of cells in the finished bread. Mixing is carried out until a suitable resistance to extension is obtained. Proofing of the wheat dough and non-wheat dough may be necessary to achieve a good cellular texture. Then, a properly weighted wheat dough part is sheeted independently such as in a standard sheeting apparatus and then, a metered amount of non-wheat dough is added onto it in a flattened block much the same way fat would be added to laminated dough.

The laminating step is used as a manner to carry out an efficient homogeneous mixing procedure of the two types of dough together while creating a gluten network effective for giving support for the starch gel of the non-wheat phase. Laminating consists of placing a flat block or layer of non-wheat dough on top of a sheet of wheat dough to form at least two wheat/non-wheat superposed layers. In a preferred aspect, the sheet of non-wheat dough is further covered by a sheet of wheat dough so as resulting in a three-layer laminate comprising wheat/non-wheat/wheat dough layers. Such a laminate can be obtained, for example, by simply providing a wheat dough layer of larger dimensions than the dimensions of the flattened block of non-wheat dough, and then, wrapping the layer of non-wheat dough at least partially with the lower layer of wheat dough so as to create an upper layer of wheat dough on the top of the non-wheat dough. Of course, the number of layers is not limited and more than three layers could be made for the laminate. However, it is preferred to have the non-wheat dough supported on each side by a wheat dough when laminating.

Then, folding and laminating several times the laminate can be carried out and rolling to final thickness and cutting to final dimensions and shapes.

Folding and sheeting up may be carried out preferably at least 6 times (corresponding to 2^6 or 64 leaves of dough) to effect a good mixing of the two doughs together. By "good mixing" it is meant that no significant separation of layers occurs during baking. Therefore, the resulting bread should not present a laminate or layered structure but rather an homogeneous structure without visible discrete regions of the non-wheat dough. The thickness of the final sheet of dough may depend on the final bread product to be obtained (for example, a thin or thick pizza-type crust, etc.). Therefore, the thickness reduction plan is usually designed with a specific product in view. Generally, the thickness of the dough is comprised between 1 to 6 mm.

If the dough contains yeast, after portioning or cutting to the desired shape such as round or square shapes, the dough pieces are allowed to proof for 15 to 60 minutes. Then, the dough is ready for storing or baking. The dough may be stored as a chilled or frozen ready-to-bake dough product in an appropriate packaging such in an impervious, gas flushed, plastic bag. When the dough product is to be frozen, it is proceeded in a freezing tunnel or a blast freezer at from -18 to -25°C . In a variant, the dough may be baked to form a partially or fully cooked bread, optionally frozen, and stored afterwards.

The present invention also offers large opportunities to create novel snack products of bread type with various fillings such as meat and sauce and/or vegetable fillings.

The following examples illustrate the present invention without limiting its scope.

Example 1 - Maize dough

A Tamal dough is prepared using nixtamalised maize flour. The term "nixtamalised" refers to the traditional method of processing maize in Mexico and Guatemala in order to produce tortillas. The process is a partial precooking and soaking of the maize kernels in an alkaline solution to release the bound

niacin and make it biologically available. The maize can then be either wet-milled to produce "masa" or dry-milled to produce tortilla flour. The resulting maize flour is mixed with water in a Kemper mixer during 5 minutes to form a base dough. The rest of the ingredients are added and mixed during 5 minutes again. Bulk fermentation of the maize dough, as resulting after mixing in a block of dough, is carried out at a temperature of 18-22°C for 10 minutes.

The Tamal dough is very short dough (i.e., not extensible but paste-like) but relatively easy to laminate into a wheat dough. Preferred amount of Tamal dough is 65 to 75% by weight.

10

The ingredients and proportions for the Tamal dough are as follows:

15	<u>Ingredients:</u>	<u>% by weight:</u>
	Nixtamalised maize flour:	40.123
	Water	40.237
	Shortening	12.225
	Salt	0.498
20	Yeast	4.714
	Egg white, powdered	2.203
	Total:	100.00

Example 2 – Rice Dough

25 Waxy or "glutinous" rice has been identified as the most promising type of rice for the dough formation. It is presumably the high content of amylopectin around 80 wt % (as opposed to 60-65 wt % for a standard rice dough) that helps to produce a relatively well structured dough. Waxy rice is

usually used for making noodles and dumplings in Eastern Asia. Our tests were started with a simplified rice dumpling dough: *Oryza sativa* (used for noodles in Asia). The dry ingredients are added to boiling water in a Björn vertical mixer. Mixing time is short, around 3 minutes on low speed. After mixing, the
5 dough is cooled down to 17-20°C before lamination. Cooling down can be sped up when rolling the dough in a layer with a thickness of about 50 mm. The dough is relatively sticky but is relatively simple to laminate it into a wheat dough because of its good elasticity and extensibility. Lamination is performed in a Rondo sheeting line. Alternatives for reducing stickiness have been tested,
10 the best solution being to chill the dough before laminating (at chilled temperature below 12°C). The preferred proportion of rice dough is of 65 to 75% w/w of the final wheat/non-wheat dough product.

15

The ingredients and proportions for the rice dough are as follows:

	<u>Ingredients:</u>	<u>% by weight:</u>
	Waxy Rice flour	41.841
	Potato Flour	4.494
20	Potato Fibre	0.280
	Salt	0.280
	Sugar	0.200
	Water	52.905
25	Total:	100.00

30 Example 3 – Tapioca dough

Tapioca flour (*Manihot utilissima*) is widely used as a source of flour or starch in tropical areas. Most tapioca products are either steamed or fried.

The tapioca dough was prepared by boiling water and oil and mixed together with tapioca starch for 4 minutes in a Kemper spiral mixer. The mixture is left at rest for cooling for 15 minutes at ambient temperature (20°C) to obtain partial starch gelatinisation. Then, it is added to the rest of dry ingredients (salt, yeast, margarine) and wet ingredient (whole egg) and mixing is maintained for 5 minutes in spiral mixer.

The dough is very short but easy to handle during lamination. The preferred amount was in the range of 65-70 % w/w of the assembled dough.

The ingredients and proportions for the tapioca dough are as follows:

10

Ingredients:	% by weight
Rapeseed oil	10.276
Water	25.590
15 Salt	0.580
Tapioca starch, native	51.799
Frozen whole egg	4.558
Yeast	2.059
Margarine	5.138
20 Total	100.00

Example 4 – Wheat dough

Three different types of dough were chosen as carriers for the non-wheat dough with the aim of covering the small meal range.

25

Specific ingredients for respectively pizza dough, a piroq dough and a pastry dough are given respectively by order:

Ingredients:	% by weight
Pizza dough:	
Wheat flour (13.6% protein)	58.635
30 Water	33.227
Yeast	2.939

	Rapeseed oil	1.759
	Sugar	1.180
	Salt	1.180
	Malt powder	1.080
5	Total:	100.00
	Piroq dough:	
	Wheat flour (13.6% protein)	59.028
	Margarine	9.838
10	Yeast	2.460
	Salt	1.040
	Sugar	1.360
	Fat powder	2.460
	Water	23.814
15	Total:	100.00
	Pastry dough:	
	Water	23.392
	Wheat flour (13.6% protein)	51.462
20	Frozen whole egg	9.357
	Yeast	3.509
	Sugar	2.339
	Salt	0.234
	Pastry margarine	9.707
25	Total	100.00

Example 5 – Wheat and non-wheat dough assembling

The three types of wheat dough as described in example 4 were

30 successively combined to the three types of non-wheat dough as described in examples 1 to 3. The number of combinations was of six different wheat/non-wheat dough products. For each possible combination, one flattened block of non-wheat dough was placed on top of the rolled-out wheat dough of larger overall dimensions. The underneath wheat dough layer was used to wrap the

35 non-wheat dough so as to substantially cover the all faces of the non-wheat dough. After wrapping, 2-by-3 lamination (representing 6 folds) of the product was carried out in a Rondo sheeting line. All the six tested non-wheat/wheat

combinations presented in the previous examples had a good workability in the Rondo sheeting line with no break or rip when subjected to the stresses of the sheeting line. Rolling out to final thickness could also be properly carried out.

5 Topping or filling of the dough was carried out. Topping of the dough consisted of layering a sauce, cheese or other ingredients on top of the dough piece (like a pizza or pie). "Filling" means that the ingredients are enclosed within the dough (such as in pirogi). Final proofing of the final dough was performed. Proofing conditions were dependent upon the dough type.

10 For example, for tamal-pizza dough: the proofing was 45 minutes at 35°C/75% HR; for tamal-piroq dough: the proofing was 35 minutes at 35°C/75% RH; for tamal-pastry dough: the proofing was 30 minutes at 35°C/75% RH.

15 Depending upon the final type of bread and the degree of cooking desired, the dough was then baked during 9-12 minutes at 190-200°C for 5-8 sec. Steam may be used for 5-8 seconds at the end of baking to reduce surface cracking.

The resulting breads were frozen in a blast freezer at -25°C and then packed in plastic bags.

Example 6 – Sensory test

20 The effect of the addition of tapioca dough (according to the recipe of example 3) to pizza dough (example 4) was sensory tested. For that, a panel of trained and experienced twelve members were presented three samples of bread; a reference sample consisting of 100% of wheat dough; a dough consisting of 25% tapioca dough and 75% pizza dough and; a dough consisting of 50% tapioca and 50% pizza dough. The evaluation was done by selecting a
25 number of attributes and providing marks to the samples from 0 to 10. The test was repeated three times. The attribute were:

"Volume" which refers to the visual impression on how the bread has risen after baking;

"brittleness" is defined by the tendency of the product to produce crumbs when bitten into it;

- 5 "firmness" which refers to capability of the bread to offer a certain resistance when biting; a crunchy bread will be well marked whereas a spongy one will be poorly marked;

"crispiness" is judged by how much sounds it makes when one bites into the product;

- 10 "compacity" refers to the capability of the bread to hold in one piece in the mouth when chewing.

The results are given below under the form of an average 0-10 scale:

Attributes:	Reference 100% wheat	25% tapioca 75% wheat	50% tapioca 50% wheat
Volume	8.28	5.73	5.73
Brittleness	2.78	6.67	5.44
Firmness	3.86	5.56	4.97
Crispiness	4.15	6.87	6.38
Compacity	6.46	4.62	5.44

- 15 The addition of tapioca dough creates a much less compact, crispier texture even at 25% level of inclusion. Addition of higher level of tapioca results in a less firm product but crispiness is maintained. This illustrates the possibilities of creating tailor-made texture by combining different levels of wheat and non-wheat dough.

Claims:

1. Method for making a bread-type dough comprising:

5 preparing a wheat dough part comprising wheat flour, fat and water and mixing in a manner effective to form an homogeneous and cohesive gluten structure and sheeting;

preparing separately a non-wheat dough part comprising non-wheat flour and water and mixing to form an homogeneous mass of dough cohesive enough to be subsequently handled;

10 assembling the wheat and non-wheat dough and laminating until to form a composite resulting dough structure.

2. Method according to claim 1, wherein the proportion of wheat dough: non-wheat dough is of from 20:80% to 40:60% by weight, preferably 30:70 to 15 35:65% by weight of the total dough product.

3. Method according to claim 1 or 2, wherein the starch of the non-wheat dough part is at least partially gelatinised either during mixing by adding water hot or before mixing by soaking in hot or boiling water or steaming.

20

4. Method according to any of the preceding claims, wherein the wheat dough part comprises from 45 to 60% by weight of wheat flour, 1 to 15% fat, 20 to 40% water, 0.1 to 2% salt, optionally egg and sugar.

5. Method according to any of the preceding claims, wherein the non-wheat dough part comprises from 35 to 55% by weight of non-wheat flour, 0 to 25% fat, 20 to 50% water, 0 to 2% salt, optionally egg and sugar.
- 5 6. Method according to any of the preceding claims, wherein after mixing of the ingredients of the non-wheat dough, the non-wheat dough is formed into a cohesive flattened block and layered on top of the sheet of wheat dough.
- 10 7. Method according to any of the preceding claims, wherein yeast is included in the wheat dough and/or non-wheat dough parts and proofing of the composite dough is carried after assembling.
8. Method according to any of the preceding claims, wherein the non-wheat
15 flour is maize, tapioca, rice, fruit, pulse or tuber flours.
9. Method according to any of the preceding claims, wherein said fat is selected from the group consisting of solid shortenings or oils.
- 20 10. Method according to any of the preceding claims, wherein the wheat and non-wheat dough are folded to at least 6 times to effect good mixing of the two doughs together.
11. Method according to any of the preceding claims, wherein assembling
25 comprises of placing a layer of non-wheat dough on top of a sheet of wheat

dough, folding and laminating several times and rolling to final thickness and cutting to final dimensions.

12. Method according to claim 11, wherein assembling further comprises

5 covering the layer of non-wheat dough by a sheet of wheat dough so as
resulting in a three-layer laminate comprising wheat/non-wheat/wheat
dough layers, folding and laminating several times and rolling to final
thickness and cutting to final dimensions.

10 13. Method according to any of the preceding claims, wherein the non-wheat
dough part is chilled before assembling to the wheat dough part.

14. Method according to any of the preceding claims, wherein the resulting
dough product is baked to produce a bread product.

15

15. Method according to any of the preceding claims, wherein the resulting
dough product is frozen.

16. Method according to any of claims 1 to 13, wherein the resulting dough
20 product is chilled.

17. A composite dough product resulting from successive laminations of a first
portion of dough and a second portion of dough wherein

the first portion of dough comprises, as an individual portion, 45 to 60% by weight of wheat flour, 1 to 15% by weight of fat, 20 to 40% by weight of water, 0.1 to 2% by weight of salt;

the second portion of dough comprises, as an individual portion, 35 to 55% by weight of flour selected among the group consisting of maize, tapioca, rice fruit, pulse, tuber flours and combinations thereof, 20 to 50% by weight of water, 0-25% by weight of fat, 0 to 2% by weight of salt.

18. Method for making a bread-type dough comprising:

mixing wheat flour, fat and water and kneading in a manner effective to develop a gluten structure and to form a first portion of homogeneous and elastic wheat dough and sheeting;

separately hydrating flour selected among the group consisting of maize, tapioca, rice, fruit, pulse, tuber flours and any combinations thereof, with water and kneading to form an homogeneous second portion of non-wheat dough cohesive enough to be capable of being flattened into a block;

assembling the first portion and second portion together and laminating several times in a sheeting line until to form a substantially composite resulting dough;

rolling to the final thickness and cutting individual portions of dough.

19. Method for making a bread-type dough according to claim 18, wherein laminating is carried out to at least 6 times to effect a good mixing of the first and second portions together.

INTERNATIONAL SEARCH REPORT

Int. Application No.

PCT/EP 01/11818

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A21D8/02 A21D10/00 A21D13/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A21D A23L A23P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

WPI Data, EPO-Internal, PAJ, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 97 25871 A (GROUPE DANONE SA ; CISAMOLO CLAUDIO (IT); NORESE GIANNI (IT); BOGLI)</p> <p>24 July 1997 (1997-07-24)</p> <p>cited in the application</p> <p>page 2, line 31 -page 3, line 28</p> <p>page 6, line 25 -page 7, line 16</p> <p>page 13, line 32-35</p> <p>page 15, line 12-16</p> <p>page 16, line 17 -page 17, line 6</p> <p>claims 1,3,4,6,11,12,16,17,22</p> <p>figure 1A</p> <p style="text-align: center;">-/-</p>	<p>1,3-6,8, 9,14,17</p>

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 01/11818

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00 59309 A (KELLOG CO ;KEEBLER CO (US)) 12 October 2000 (2000-10-12) cited in the application page 4, line 6-30 page 6, line 10-21 example 1 claims 1,3-8,18,24 ---	1,6,8,9, 14,18
X	WO 97 06691 A (GROUPE DANONE SA ;FRISONE FRANCO (IT); CISAMOLO CLAUDIO (IT); NORE) 27 February 1997 (1997-02-27) page 5, line 11-36 claims 1,9,17,18 ---	1,5,6,8, 9,14
A	US 5 514 397 A (SHAPIRO LORENZO A) 7 May 1996 (1996-05-07) figure 13A column 3, line 14-49 column 5, line 14-36 column 6, line 7-14 claims 1,2,4,10-13,17,18 ---	1,6,8, 11,12,18
A	US 5 558 890 A (BROWN GEORGE E ET AL) 24 September 1996 (1996-09-24) figure 1 column 1, line 41-45 column 3, line 49-59 column 4, line 1-38 column 5, line 53 -column 6, line 9 claims 1-8 -----	1,6, 8-11,18, 19

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/EP 01/11818

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9725871	A	24-07-1997	FR 2743472 A1 AU 1314797 A EP 0874552 A1 WO 9725871 A1	18-07-1997 11-08-1997 04-11-1998 24-07-1997
WO 0059309	A	12-10-2000	US 6267998 B1 AU 4182600 A EP 1164855 A1 WO 0059309 A1	31-07-2001 23-10-2000 02-01-2002 12-10-2000
WO 9706691	A	27-02-1997	FR 2737840 A1 AT 207699 T AU 6824696 A DE 69616473 D1 EP 0766921 A1 WO 9706691 A1	21-02-1997 15-11-2001 12-03-1997 06-12-2001 09-04-1997 27-02-1997
US 5514397	A	07-05-1996	NONE	
US 5558890	A	24-09-1996	NONE	